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DU PONT POLYMERS
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JUNE 11, 1991

TO: POLYMERS OCCUPATIONAL HEALTH SITE CONTACTS

FROM: AMY S. BERG
Amy S Berg

AELs - ACCEPTABLE EXPOSURE LIMITS

The following changes were made in the AEL list at the June meeting. Please replace the corresponding pages in your AEL list with the attached.

Ammonium Perfluoro-octanoate (C-8) (Polymers) [3825-26-1]	CEGw = 1 ug/L.
DPX-E9636 (Used in Titus\ Herbicide) (AG) [122931-48-0]	AEL = 5 mg/m3 (8- and 12-hour TWA), total dust.
Propylene Glycol Monomethyl Ether Acetate (IMG) [108-65-6]	AEL = 10 ppm (8- and 12-hour TWA).
RODA (Chemicals) [2479-46-1]	AEL = 0.5 mg/m3 (8- and 12-hour TWA).
Siduron (AG) [1982-49-6]	AEL = 10 mg/m3 (8- and 12-hour TWA), total dust).
Hydrazine (Fibers).	An AEL of 0.05 ppm (8-hour TWA), skin was established in 1990. When hydrazine came up for finalization, it was decided to look at the data once more. After reviewing these data, it was decided to reduce the AEL to 0.01 ppm (8- and 12-hour TWA), skin. These data will be part of an updated hazard determination letter that will be released on June 7, 1991.
Dimethylacetamide [127-19-5]	AEL = 10 ppm (12-hour TWA), skin.
HCFC-123 [306-83-2]	EEL = 1000 ppm (2-60 minutes) with a 2500 ppm 1-minute ceiling concentration.

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Note that you were mailed a complete new list in May. Any pages from old revisions or lists (with dates in the lower left corner earlier than May 15, 1991) should be discarded.

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April 25, 1991

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ACCEPTABLE EXPOSURE LIMITS (AEL) LIST - PREFACE

AELs

AELs are exposure limits for chemicals (or for levels of physical agents) set by the Du Pont AEL Committee. AELs specify Time-Weighted Average (TWA) airborne concentrations, doses or biological limits which should not be exceeded, and applicable time periods.

AELs may be set to prevent health effects from exposures for full workshifts (e.g., 8-hour or 12-hour TWA); or to prevent effects from shorter period exposures such as irritation, narcosis, odor or nuisance (e.g., 15-minute TWA). As a general guide, excursions to which short-period AELs apply should occur no more than four times per shift and a recovery period of approximately 30 minutes is required between excursions. In addition, the corresponding full shift (8-hour or 12-hour) AELs should not be exceeded.

AELs are set by the Du Pont AEL Committee, which includes experts in toxicology, industrial hygiene, occupational medicine, pathology, and epidemiology. AELs are based on the best available information from industrial experience, animal studies, and controlled human studies. They are guidelines based on informed judgment, and are not fine limits between safe and dangerous concentrations. They are not for use as relative toxicity indexes, limits for continuous uninterrupted exposure, or proof or disproof of health effects. They should be interpreted and applied by appropriately qualified personnel. Specific questions or consequences of occasional excursions above an AEL should be addressed to the Safety, Health and Environmental Affairs (SHEA) Manager for your business or staff function. Du Pont Engineering Standard S-12-T, "Strategy for Workspace Sampling for Exposures to Chemicals", provides guidelines for evaluation of air sampling data.

An AEL is established in three basic steps. The first step is a request for an AEL by a staff or business function. The second is review of the available toxicity and human health data followed either by a recommendation for a provisional AEL or a recommendation for additional information (i.e., additional testing, or more complete test data from another company). An AEL is in effect but provisional for six months; it is then reviewed to become a final AEL in light of workplace experience and any new data. This review, the third step, concludes the process. However, AELs are updated every five years, or sooner if warranted by new data, by a special subcommittee appointed by the AEL Committee. If this update indicates new data are available that might result in a change in the AEL, the chemical is referred back to the AEL Committee for review.

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COMMUNITY EXPOSURE GUIDELINES (CEGs)

CEGs are exposure guidelines that are expected to be without any effect to members of the community during continuous 24-hour a day exposure to a chemical or physical agent. CEGs may be recommended for air or water or for both. As with AELs, CEGs are based on the best available information from industrial experience, animal toxicity studies, controlled human exposure studies, and epidemiological findings. However, because of the variability of sensitivities of members of the community (e.g., the infirm, the old, the young, pregnant females, etc.), versus the healthy worker involved with an AEL, a larger uncertainty factor needs to be used in extrapolating these data to a CEG.

EMERGENCY EXPOSURE LIMITS (EELs)

EELs are set for emergency situations, such as a spill or accidental release of a chemical. They specify brief durations and concentrations from which escape is feasible without any escape-impairing or irreversible effects on health. EELs are only applicable to emergency situations where occurrence is expected to be rare in the lifetime of an individual.

OTHER SOURCES OF EXPOSURE LIMITS

AELs supplement any mandatory regulatory limits developed by national or local governmental agencies. The more stringent limit, either that developed by Du Pont or by the regulatory agency, shall apply.

The American Conference of Governmental Industrial Hygienists (ACGIH) annually publishes a booklet containing Threshold Limit Values (TLVs) for many chemical substances and physical agents. Also, the American Industrial Hygiene Association (AIHA) publishes Workplace Environmental Exposure Limits (WEELs) for some chemicals not found in the TLV booklet. ACGIH TLVs and AIHA WEELs should be used as guidelines for workplace exposures if no other more appropriate limit exists. If a staff or business function has some concern about the validity of a TLV or WEEL, then the AEL Committee should be asked to establish an AEL.

Other compilations of limits (e.g., American Society of Testing and Materials (ASTM) and American National Standards Institute (ANSI) should be used after consultation with your Safety, Health and Environmental Affairs Manager and with Haskell Laboratory.

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HAZARD DETERMINATION GUIDELINES

In Du Pont, hazard determination is defined in a corporate policy (1) quoted below:

When toxicologic and/or epidemiologic data indicate that a chemical might present a carcinogenic, reproductive, developmental, or mutagenic hazard, any staff or business function which proposes to initiate the hazard determination procedure shall inform other interested staff and business functions before issuing a formal request for such determination. Following receipt of the request, the Director of Haskell Laboratory and the Corporate Medical Director shall evaluate the data, and after review by the Vice President of Safety, Health and Environmental Affairs, shall discuss their evaluation with the involved staff and/or business functions. This discussion should cover the extent of knowledge about the hazard associated with the chemical and should also give an indication about the potency of the chemical. The Director of Haskell Laboratory and the Corporate Medical Director will confirm the results of the discussion by letter to the appropriate SHEA manager(s) or their representative.

Carcinogens, developmental and reproductive toxins, and mutagens are defined as follows:

Carcinogen - A substance or agent with the potential to produce or incite cancer. Potency is determined by consideration of the following factors:

- Amount of chemical (dose) required to produce the effect
- Route of exposure
- Type of tumor(s), site, benign or malignant
- Number of animal species affected
- Tumor incidence
- Time to tumor formation
- Metabolism
- Genotoxic effects
- Other factors such as hormonal status, target organ for non-carcinogenic lesions, etc.

Substances or agents considered potent are identified on the AEL List by a capital letter C; less potent substances or agents are identified by a small letter c; substances or agents not considered to be carcinogens are identified by a C in parentheses, e.g., (C).

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(1) "Guidelines: Control of Carcinogenic, Reproductive, Developmental, and Mutagenic Risks Posed by Chemicals Made or Used within Du Pont". ELC Corporate Policy and Guidelines, IIC (February 1990).

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Developmental Toxin - An agent with the potential to interfere with the development of an individual while in utero or after birth.

Potency is determined by the Developmental Hazard Index (DHI) which is the ratio of the minimum dose toxic to the mother and the minimum dose toxic to the conceptus. Substances or agents with DHIs of greater than 5 are considered potent and are identified on the AEL List by a capital letter D; DHIs of 3 to 5 indicate a less potent substance or agent and are identified on the AEL List by a small letter d; substances or agents with a DHI of less than 3 are not considered developmental toxins and are identified on the AEL List by a D in parentheses, e.g., (D).

Reproductive Toxin - An agent with the potential to affect adversely the reproductive process of adult males and/or females.

Potency is determined as follows:

- Reproductive toxicity occurred at a dose level considerably below that resulting in other signs of toxicity. These substances or agents are considered potent and are indicated on the AEL List by a capital letter R. Male or female will also be indicated if reproductive toxicity occurred only in one sex.

- Reproductive toxicity occurred at a dose level at or just below that resulting in other signs of toxicity. These substances or agents are considered less potent and are identified on the AEL List by a small letter r. Male or female will also be indicated if reproductive toxicity occurred only in one sex.

- If reproductive toxicity occurred, but only at a dose level considerably greater than that resulting in other signs of toxicity, these substances or agents are not considered reproductive toxins and are identified on the AEL List by an R in parentheses, e.g., (R).

Mutagen - A mutagen is an agent with the potential to cause permanent heritable damage in germ (reproductive) cells of exposed individuals. A substance is identified as a mutagen if it is:

- A proven germ cell mutagen,
- Positive in a mammalian in vivo germ cell assay for gene mutations or chromosome aberrations, and/or
- Positive in a mammalian in vivo somatic (non-reproductive) cell assay for gene mutations or chromosome aberrations, and, in addition, the substance is either positive in a mammalian in vivo germ cell assay for DNA damage and repair, or is identified on the AEL List as a reproductive toxin.

Potency is determined by evaluating the following:

- The experimental design and route of administration.
- The dose required to produce genotoxicity.
- The magnitude of the genotoxic response and the presence of a dose-response relationship.
- The general concordance of positive findings among different germ cell genotoxicity assays (if known).
- The genetic endpoint assessed (gene mutations, chromosome aberrations, DNA repair).

Potent mutagens are identified on the AEL List by a capital letter M whereas less potent mutagens receive a small letter m. Agents not considered to be mutagens are identified by a capital letter M in parentheses, e.g., (M).

LIMITS FOR NON-FIBROUS AEROSOLS

The particle size distribution of inhaled material plays a major role in how much and where material is deposited within the respiratory tract. In general, particles having a mass median aerodynamic diameter greater than 30 micrometers are non-respirable. Respirable-size particles are typically defined as particles with a mass median aerodynamic diameter of less than or equal to 3 micrometers. Particles between 30 and 5 micrometers are deposited in the upper respiratory tract (nose) and do not pose a significant hazard to the airway and gas exchange region of the lung. Respirable particles which can deposit in the gas exchange region (< 1 micrometer) can interfere with oxygen transfer or pass directly into the blood. Some AELs for aerosols pertain only to the respirable fraction and these would be so designated on the AEL list. Compliance with respirable fraction AELs is determined from the fraction of aerosol passing a size selector. Thus, when sampling for particulate in air, the particle size (respirable fraction) must be established as follows:

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RESPIRABLE AEROSOL DEFINITION

Some AELs for aerosols pertain only to the respirable fraction, i.e., that portion of the aerosol which is small enough to reach the lower respiratory tract. Compliance with these AELs should be determined from the fraction of aerosol passing a size selector with the following characteristics (2).

Aerodynamic Diameter (microns)	Percent Passing Selector
≤ 2.0	90
2.5	75
3.5	50
5.0	25
10.0	0

The AEL for particulates is generally expressed as milligrams per cubic meter (mg/m^3) total particulate. Respirable fractions are routinely assumed to be not more than 1/2 of the total particulate limit. Limits are established on a respirable fraction basis only when the particulate poses a significant hazard to the airway gas exchange region of the lung.

LIMITS FOR FIBERS

Fibrous dusts present a special hazard because the physical properties of dust (length versus width of the particle) impart special aerodynamic and, as a result, toxicologic characteristics.

A fiber is defined as a particle having an aspect ratio (length:width) greater than 3. In addition, the fiber must be of respirable size.

Until recently, a mass standard was used for quantification of fiber exposure. However, it has now been demonstrated that the utilization of gravimetric concentrations for comparing the relative toxicities of different fiber types is misleading. For this reason, fiber concentrations are usually reported as fibers/cc.

The AEL Committee has established an upper limit of 2 fibers/cc which incorporates advancing understanding of the biological consequences of deposition of respirable fibers.

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(2) AIHA Aerosol Technology Committee: Interim Guide for Respirable Mass Sampling, Am. Ind. Hyg. Assoc. J., 31(2):133 (1970).

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NUISANCE DUST LIMITS

Nuisance dusts are those that appear to have no biological effects at exposure levels that do not overload lung clearance mechanisms. Total particulate concentration for nuisance dusts should not exceed 10 mg/m^3. This limit is set to prevent reduced visibility, to prevent deposits in the eyes, ears and nasal passages, and to prevent injury to the skin or mucous membranes caused by chemical contact or by the mechanical process of cleansing. Respirable concentrations of nuisance dusts usually do not exceed 5 mg/m^3. This limit for nuisance respirable particulate should 1) protect the architecture of the air space, 2) prevent the formation of significant amounts of collagen (scar tissue), and 3) protect against the development of non-reversible particle-induced lung injury.

EXPLANATION OF AEL LIST

Chemical [CAS Registry Number]

The more common chemical name used within Du Pont and its Chemical Abstracts Service (CAS) Registry Number are given.

AEL

AELs for particulates are expressed as mg/m^3 and apply to actual site temperature and pressure conditions. Sampled air volumes should not be converted to 760 mm Hg and 25°C when calculating measured mg/m^3 concentrations for comparisons with AELs.

AELs for gases and vapors are expressed as parts per million (ppm by volume) at 760 mm Hg and 25°C. Measured ppm air concentrations should be compared with these limits under comparable temperature and pressure conditions.

Biological limits are the allowable concentration of a chemical or its metabolites found in a body specimen (e.g., blood or urine). The units may vary depending on the body specimen used (e.g., a blood limit would be expressed as ug of chemical per 100 g (dL) of blood).

REMARKS

This column contains additional information such as AEL averaging time (e.g., 8-hour TWA), regulatory classifications (e.g., OSHA Regulated), other appropriate limits (e.g., TLV or WEEL), particulate information (e.g., total dust), and any skin notation.

The skin notation indicates that the chemical may be absorbed through the skin or mucous membranes in toxicologically significant amounts. This notation implies that measures must be taken to minimize cutaneous contact. Corrosive chemicals are not identified by this notation.

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DATE/STATUS

Provides the year an AEL was initially finalized or most recently updated or indicates that an AEL is still provisional (P) and the year it was made provisional. AELs are updated every five years or sooner if warranted by new data. The Secretary of the AEL Committee maintains a file showing the history of the AELs; i.e., when the AEL was established, when updates occurred, etc.

ELC GUIDELINES

The symbols used in this column are defined below. If you have any question about the significance of any symbol, contact your Safety, Health and Environmental Affairs Manager.

The capital letters "C", "R", "D", and "M" identify chemicals that have undergone a hazard determination and a decision has been made that a special annual employee communication is REQUIRED and must be documented (S&OH Guideline 9.2) concerning the chemical's carcinogenic, reproductive, developmental, or mutagenic hazard. The Special Procedure dictated by ELC Policy IC applies. These chemicals are considered potent.

The small letters "c", "r", "d", and "m" identify chemicals that have undergone a hazard determination and a decision has been made that a special annual employee communication is NOT REQUIRED, provided that (1) the results of the hazard determination are included with the normal toxicity information available to employees about chemicals in their workplace, and (2) upon completion of the hazard determination, employees shall be notified of the results of that hazard determination. The Special Procedure dictated by ELC Policy IC applies. These chemicals are considered less potent.

Parentheses (C), (R), (D), and (M) identify chemicals that have undergone a hazard determination and a decision has been made that no hazard exists. The Special Procedure dictated by ELC Policy IC does not apply.

NEW ENTRIES OR CHANGES SINCE LAST ISSUE OF THE LIST

The "†" symbol in the far left column indicates a new entry on the list or a change has been made since its last issue.

Richard C. Graham
AEL8.10
April 22, 1991

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